DEPARTMENT OF ENERGY
Nevada Operations Office
Las Vegas, NV

DOE ORDER 232.1

TRENDING & ANALYSIS

REPORT

Second Quarter

1997

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INTRODUCTION

This Department of Energy, Nevada Operations Office (DOE/NV) Quarterly Trending & Analysis Report (QT&AR) covers the second quarter of 1997. The DOE/NV QT&AR includes data from the Occurrence Reporting and Processing System (ORPS) calendar quarter, which ended June 30, 1997.

The DOE/NV QT&AR is based on DOE/NV ORPS reports issued under DOE Order 232.1, *Occurrence Reporting and Processing of Operations Information* and its earlier versions. This report consists of a management summary and statistical data on occurrences reported by DOE/NV and its contractors/users. Also, included are items of interest from events occurring at other DOE locations.

Not all of the eleven active DOE/NV contractors/users registered in ORPS as Facility Managers (FMs) for DOE/NV's thirty-nine active facilities, will appear in this report. The QT&AR includes only the DOE/NV contractors/users who submitted occurrence reports in ORPS.

The abbreviations (recognized by ORPS) for the DOE/NV contractors/users appearing in this report follow:

BNLV	Bechtel Nevada
DSWA	Defense Special Weapons Agency
GONV	Nevada Operations Office
ITNV	IT Corporation
LANV	Los Alamos National Laboratory - Nevada
LLNV	Lawrence Livermore National Laboratory - Nevada
SDNL	Sandia National Laboratory, Nevada
WSIN	Wackenhut Services, Inc.

FACILITY MANAGERS AND FACILITY MANAGER ADMINISTRATORS

an excerpt from the June 1997 ORPS Bulletin

The Authority File on ORPS lists the names and telephone numbers of all individuals responsible for transmittal and sign-off of occurrence reports at DOE facilities. Before DOE Order 232.1, this included the Facility Manager/Designee (FM/FMD), Facility Representative/Designee (FR/FRD), and the Program Manager/Designee (PM/PMD) at each facility. In addition, the Authority File also included (and still does) the Field Office, Area Office, Secretarial Office(s), and Contractor(s) information associated with each facility.

When DOE Order 232.1 became effective on October 30, 1995, a change was made to the occurrence report transmittal requirements. This change allows a Facility Manager Administrator (FMA) to transmit an occurrence report for the FM/FMD, once the FM or FMD has signed the hard copy report. This change now means that the **name of the FM or FMD may no longer be listed in the Authority File**, since it is possible that they may no longer transmit occurrence reports to ORPS.

Please remember that the FM or FMD still has the direct line responsibility (1) for the operation of a facility or group of related facilities, (2) for initiating occurrence reports for the facilities for which the FM or FMD is responsible, and (3) for transmitting occurrence reports to the ORPS data base. If the Facility Manager Administrator transmits the occurrence report to ORPS for the Facility Manager, then the FM or FMD is required to sign the reports in hard copy before transmittal.

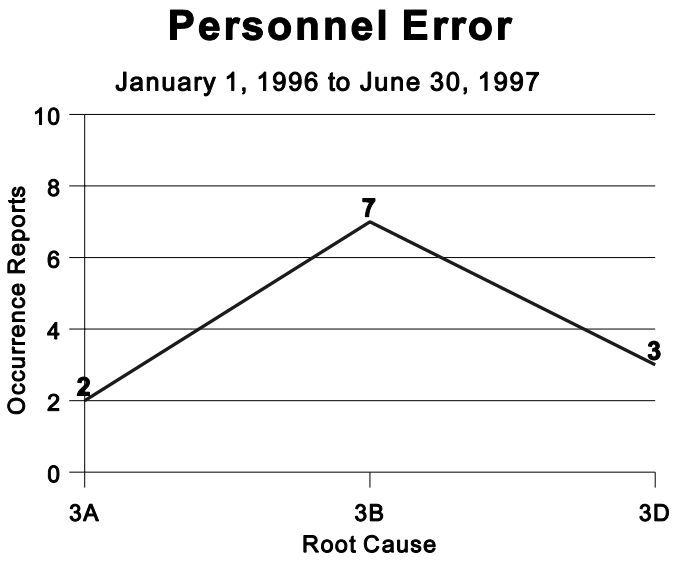
CONDUCT OF OPERATIONS

As part of the continuing effort to improve consistency of occurrence reporting, DOE/NV will periodically highlight areas of concern.

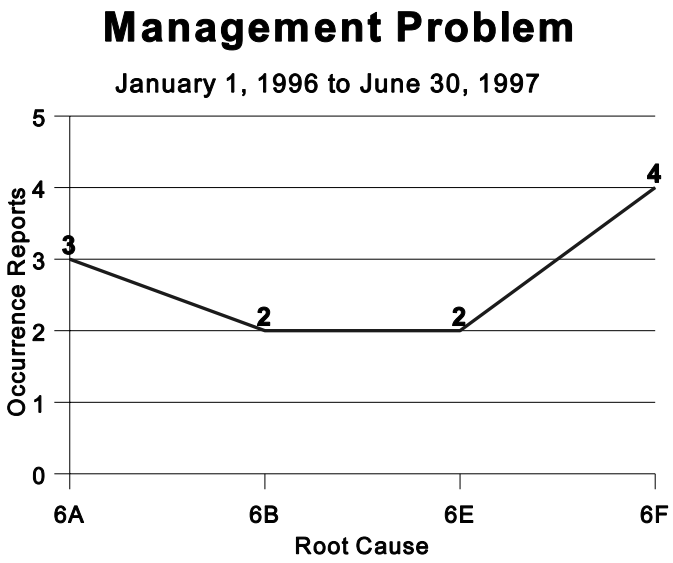
The first area of concern is the possibility of occurrences not reported through the proper channels or not reported at all. This is an area that requires attention from not only DOE/NV but DOE/NV contractors/users as well.

Another area of concern to DOE/NV is the increase in reporting of the following root cause: Personnel Error and Management Problem.

The following data were retrieved from DOE/NV final reports issued from January 1, 1996 through June 30, 1997. The root causes reported for this period were Equipment/Material Problem (1), Procedure Problem (4), Personnel Error (12), Design Problem (2), Management Problem (11), External Phenomena (11), Radiological/Hazardous Material Problem (1).



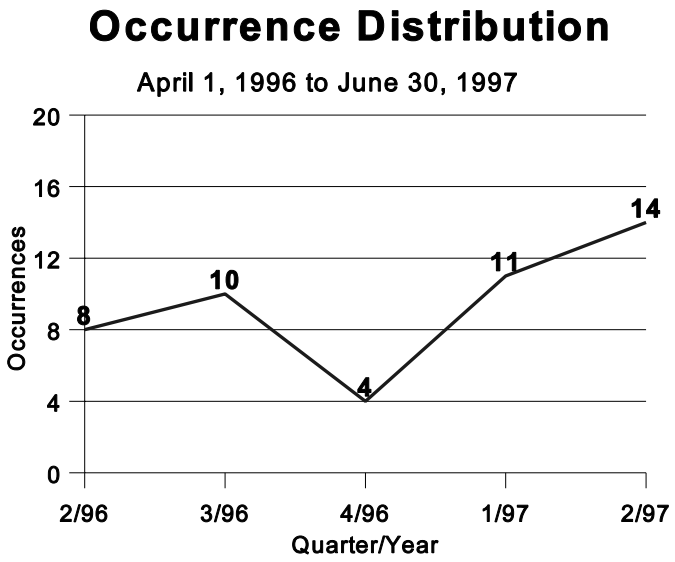
The chart for Personnel Error highlights the subgroups' Inattention to Detail (2), Procedure Not Used or Used Incorrectly (7), and Other Human Error (3).



The chart for Management Problem highlights the subgroups' Inadequate Administrative Control (3), Work Organization/Planning Deficiency (2), Policy Not Adequately Defined, Disseminated, or Enforced (2), Other Management Problem (4).

MANAGEMENT SUMMARY

This section summarizes general trends, observations, and lessons learned during the compilation, evaluation, and reporting of occurrences for this quarter. Based on the occurrence discovery date, ORPS identified fourteen new reports this quarter.



Occurrences by Contractor
August 1, 1990 to June 30, 1997

Contractor	BNLV	DSWA	GONV	ITNV	LANV	LLNV	SDNL	WSIN
Total	31	2	8	1	4	14	6	70
Quarter	10	0	0	0	0	0	1	3

MANAGEMENT SUMMARY

Emergency

DOE/NV has never categorized an event as an "Emergency" since the start of ORPS.

Unusual Occurrence

DOE/NV categorized two events as Unusual Occurrences (UOs) this quarter. Both were reported under the Safeguards/Security ORPS reporting area.

DOE/NV has reported 58 occurrences as UOs since the start of ORPS. They reported them under the following ORPS reporting areas: Safeguards/Security (52%), Environmental (22%), Facility Condition (12%), Personnel Safety (7%), Facility Status (3%), Value Basis Reporting (2%), and Cross-Category Items (2%).

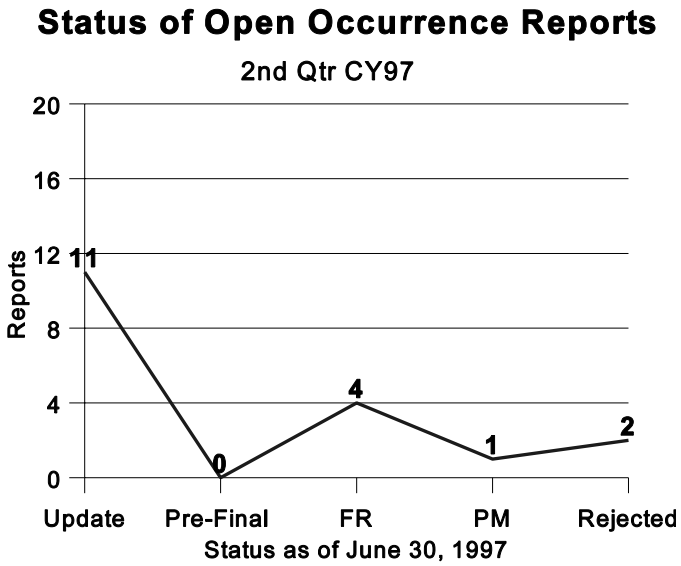
Off-Normal Occurrence

DOE/NV categorized twelve events as Off-Normal Occurrences (ONs) this quarter. They reported them under the following ORPS reporting areas: four under Facility Condition, three under Environmental, two under Personnel Radiation Protection, two under Safeguards/Security, one under Personnel Safety, and one under Cross-Category Items. Note that occurrences may be categorized under more than one reporting area.

DOE/NV has reported 613 occurrences as ONs since the start of ORPS. They reported them under the following ORPS reporting areas: Facility Condition (31%), Environmental (21%), Personnel Safety (15%), Safeguards/Security (10%), Cross-Category Items (10%), Personnel Radiation Protection (5%), Value Basis Reporting (4%), Transportation (2%), Facility Status (1%), and Nuclear Explosive Safety (1%).

TRENDING AND ANALYSIS

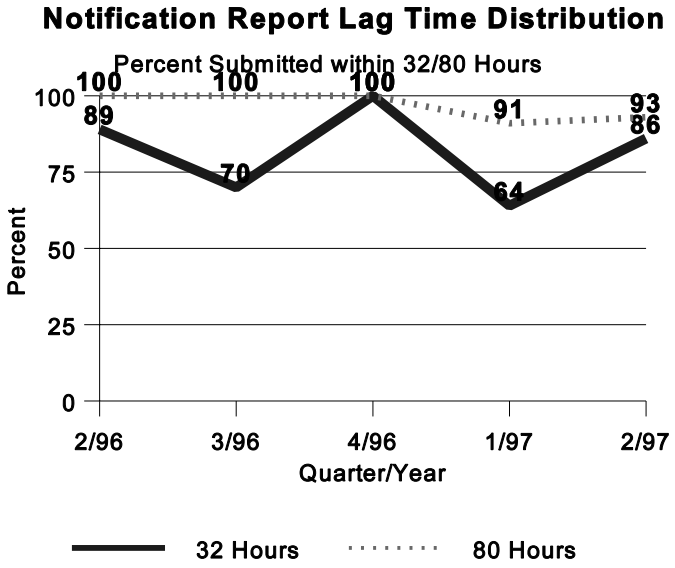
Since the start of ORPS, DOE/NV has reported 670 occurrence reports. As of June 30, 1997, 652 occurrence reports have been completed. Of the eighteen reports that remain open, sixteen are being completed and two have been rejected pending further action.



REPORT TIMELINESS

Notification Reports

DOE Order 232.1 requires submittal of a Notification Occurrence Report (NOR) within 80 hours of the time of categorization. DOE/NV submitted 86% percent by the close of the next business day and 93% within the 80-hour criterion this quarter.



Notification Report Lag Time
2nd Qtr CY97

Hours	0 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	30+
Reports	5	2	0	1	1	2	3

Update Reports

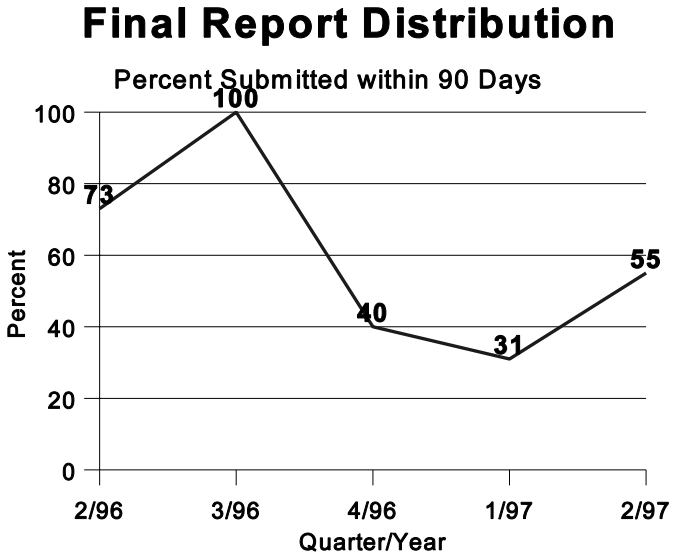
The FM submits an Update Occurrence Report (UOR) when significant and new information is available or upon request by DOE/NV. They will submit a UOR within 45 days after categorization if the required analysis of an event cannot be completed.

The report will explain the delay and provide an estimated date for submittal of the Final Occurrence Report (FOR).

Final Reports

The FM completes an FOR and submits the FOR to the FR as soon as practical, but within 45 calendar days after categorization. The FR will review, approve, add any comments, and forward the FOR to the PM within 10 calendar days of receipt. The PM will review, approve, and add any comments to the FOR within 14 days of receipt. If either the FR or the PM has not approved the FOR, they will return it to the FM with an explanation for the disapproval. An FOR is considered final when the FM, FR, and/or PM have all approved and signed the report.

DOE Order 232.1 establishes a 45-calendar-day criterion for completion of FORs by the FM. DOE/HQ established an internal goal that 90% of reports should meet the 45-day criteria. The QT&AR follows that criterion here for comparison purposes. Analysis of data for this quarter shows a percentage decrease from a year ago and a percentage increase from the preceding quarter. During this quarter, eleven FORs were submitted with an average lag time of 123 days. Six of the FORs met the 90-day criterion and five met the 45-day criterion.



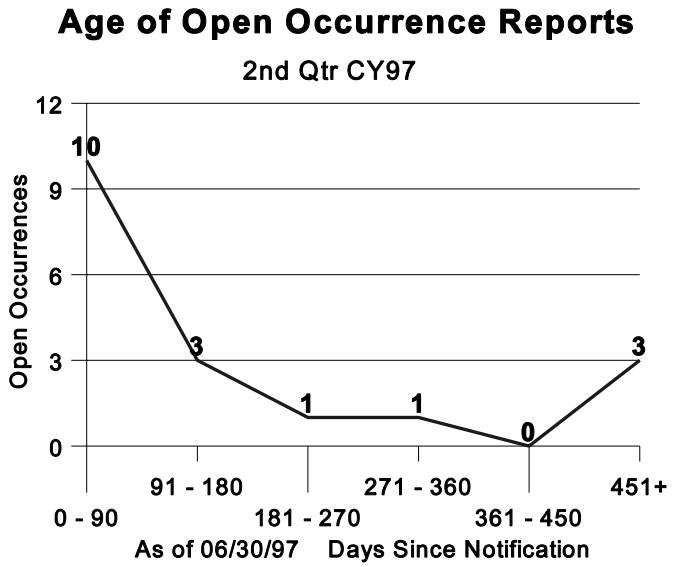
REPORT TIMELINESS

Final Report Lag Time
2nd Qtr CY97

Days	0 - 15	16 - 30	31 - 45	46 - 60	61 - 75	76 - 90	90+
Reports	4	1	0	0	1	0	5

Backlog of Open Occurrence Reports

As of June 30, 1997, DOE/NV had eighteen open occurrence reports. Eight reports have been open longer than 90 days. Three reports, still in the pre-final stage, have been open more than 500 days. DOE/HQ and DOE/NV each rejected one open occurrence report. The reports are awaiting further action. The remaining sixteen open occurrence reports are awaiting an update or pre-final action.



ROOT CAUSE ANALYSIS

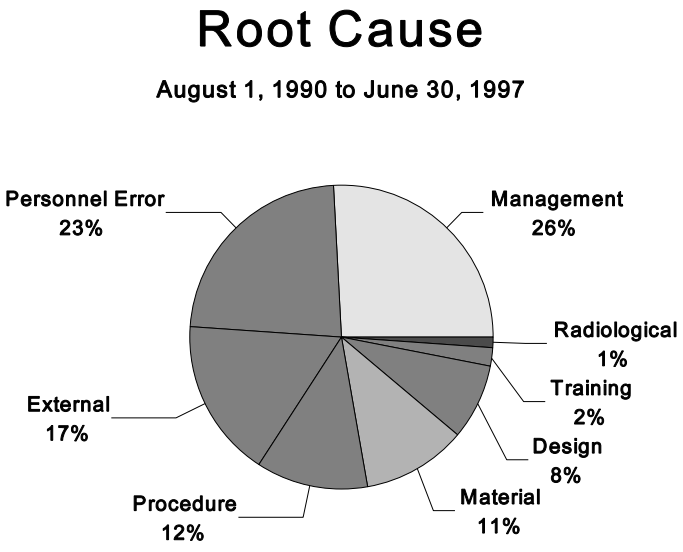
Since the start of ORPS, DOE/NV has reported 660 root causes with the following distribution:

Management Problem at 26%, with the following subgroups identified (1) Inadequate Administrative Control and (2) Policy Not Adequately Defined, Disseminated, or Enforced.

Personnel Error at 23%, with the following subgroups identified (1) Inattention to Detail, (2) Procedure Not Used or Used Incorrectly, and (3) Other Human Error.

External Phenomena at 17%, with the following subgroups identified (1) Weather or Ambient Condition and (2) Theft, Tampering, Sabotage, Vandalism.

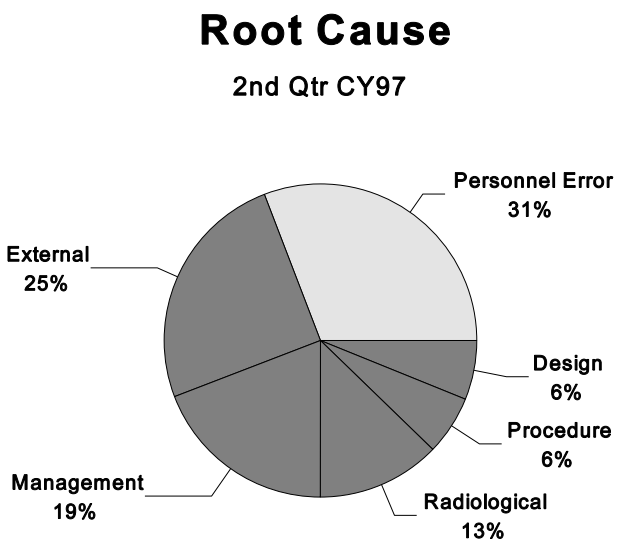
The remaining root causes are Procedure Problem 12%, Equipment/Material 11%, Design Problem 8%, Training Deficiency 2%, and Radiological/Hazardous Material Problem 1%.



ROOT CAUSE ANALYSIS

This quarter, DOE/NV reported sixteen root causes with the following distribution:

Personnel Error 31%
External Phenomena 25%
Management Problem 19%
Radiological/Hazardous Material Problem 13%
Procedure Problem 6%
Design Problem 6%

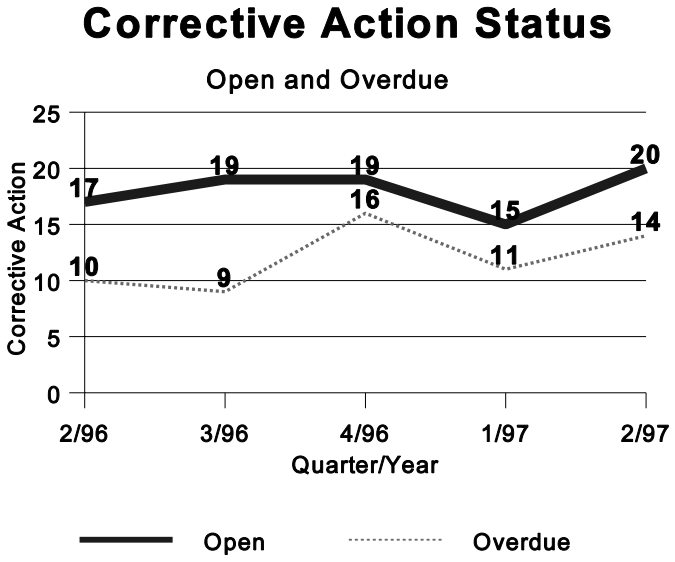


Root Cause Distribution
Breakdown by Category

Root Cause	Total	Quarter
Equipment/Material	77	0
Procedure Problem	82	1
Personnel Error	151	5
Design Problem	50	1
Training Deficiency	16	0
Management Problem	169	3
External Phenomena	109	4
Radiological/Hazardous Material Problem	2	2
Other	4	0

CORRECTIVE ACTIONS

As of June 30, 1997, DOE/NV had twenty open corrective actions. Fourteen open corrective actions are overdue. Note that because revised target completion dates are included each quarter, comparisons between quarterly corrective action status data are not meaningful. The distribution of actions changes whenever they update the status.



DOE/NV OCCURRENCE REPORTS

verbatim from the occurrence reports residing in ORPS

DOE/NV categorized fourteen events under ORPS for this quarter, two as UOs and twelve as ONs. Address any questions or comments to Deborah Binder at 295-6351 or the EOC personnel at 295-1422. A description of occurrence for each event follows.

Asbestos Incident
(NVOO--BNLV-NTS-1997-0005)

Subcontractor personnel from Modern Control and Refrigeration were modifying the existing HVAC system within Building 725 according to approved engineering drawings. They encountered asbestos insulation on pipe elbows in the mechanical room. Modification to the HVAC system was stopped. The Industrial Hygiene Department was notified immediately. Air and surface samples were taken.

Oil Spill
(NVOO--BNLV-NTS-1997-0006)

A 55-gallon drum (Waste Tracking number 544-230) of non-PCB compressor oil developed a leak. The drum had rusted through at the bottom and leaked approximately 35 gallons onto the ground and gravel. It was discovered at 0945 hours on April 28, 1997. The drum was behind Building CP-162 in Area 6. This drum was originally sampled for chlor-d-tect on March 17, 1997. The results showed a concentration of 2,700 ppm total halogens. An additional sampling was scheduled to complete the characterization. The drum, oil, and excavated soil were packed into an 85-gallon container.

Mobile Crane Damage
(NVOO--BNLV-NTS-1997-0007)

On March 20, 1997, Bechtel Nevada Construction Services obtained a 140-ton Grove mobile crane, Model 73185 from Fleet and Equipment Operations to move a 18,000 pound silo from Area 6 to Area 1. Late in the day, a crane operations crew picked up the silo and loaded it onto a flat bed truck. They prepared the crane for transport.

On March 24, 1997, a second crane operations crew moved the crane to Area 1 to unload the silo. During the setup, the crane's outriggers were extended but would not manually lock in place. Since the 18,000 pound silo was within the crane's rubber rating (without outriggers) the crew decided to continue with the unloading operation.

After the operation was completed, they returned the crane to Fleet and Equipment Operations and the outrigger defect was reported.

Construction Services management was informed on March 31, 1997, of the damages and that the suspected cause was operator error. Estimated damage to the four outriggers is $35,000. After disassembly of the outriggers, a joint review by the Fleet and Equipment Operations and Construction Services to observe internal damage was completed. They did this review on April 16, 1997.

On April 16, 1997, when the mechanic broke down the outriggers to find the cause of the failure; it was discovered the manual lock threads were crushed. The only way this could have happened is if the outriggers were retracted when manual locks were in place.

Theft of Government Property
(NVOO--BNLV-NTS-1997-0008)

On April 2, 1997, a theft of government property was discovered by Bechtel Nevada Construction personnel. Two trailers and one tool cart were broken into. Tools and equipment were missing from inside. The trailers and cart were part of a Test Readiness Project in Area 2, Nevada Test Site. An inventory list (dated 1992) identified the missing items. The items ranged from portable saws to hand tools. The estimated total replacement cost is $11,863. Bechtel Nevada Security was contacted immediately after discovery. An investigation is in progress.

Radiation Safety Violation
(NVOO--BNLV-NTS-1997-0009)

A Cashman Equipment Company repair/maintenance person was dispatched to do routine maintenance on the rental water master truck at the Clean Slate #1 project outside the exclusion zone. He was escorted to the truck and released to do the maintenance. Another water truck owned by Bechtel Nevada was parked within the exclusion zone approximately 100 feet away. The maintenance person had a list of other equipment to service and spotted the Bechtel Nevada water master truck. He went through the temporary fence line to check the license plate.

The operator of the Bechtel Nevada truck discovered the maintenance person within the exclusion area and directed him to return to the fence and wait for a Radiological Control Technician. The survey results were 150 dpm alpha on his hands and 380 dpm on his shoes. The maintenance person was decontaminated. The activity detected on his hands was likely a combination of radon daughters and the survey instrument's background variation but was well below reportable levels for alpha contamination.

The nearest radiological warning sign was thirty feet away from his entry into the exclusion area. Additional radiological signs were posted on the exclusion fence near the location of the water storage tank. A tailgate safety meeting was held the following morning to inform all personnel on the policy for visitors to report to the base camp office or radiological control base station for a briefing before working near the exclusion zone fence.

Unplanned Power Outage
(NVOO--BNLV-NTS-1997-0010)

On May 13, 1997, an unplanned power outage occurred from 0850 hours to 0915 hours in Area 1 and Area 6 at the Nevada Test Site. This power outage seriously affected normal operations at the U1A tunnel in Area 1. Even after the power was restored, power fluctuations continued. All personnel were evacuated until power was stabilized at 1200 hours. A power outage occurred at the Tweezer Substation in Area 6 when the main transformer went down. Power to Area 1 and Area 6 was provided by other substations. An investigation and repair operations are in progress as to the power outage cause.

Near Miss of Severe Electrical Shock
(NVOO--BNLV-NTS-1997-0011)

On May 13, 1997, at 0910 hours, Bechtel Nevada Construction personnel removed a sign post that was in contact with a high voltage line near the Fleet Operations and Equipment yard in Area 6 causing a power outage. Bechtel Nevada Construction was doing excavation in support of the Environmental Remediation Project in Area 6. Before excavation, they surveyed the area to find all utility lines. After completion of the survey they discovered a sign post was installed over a high voltage line. They were unaware the shaft of the sign post was driven past the concrete incasement and was into the power line insulation. While removing the sign post, it caused the transformer breaker to trip. The result was a power outage in the immediate area. No injuries resulted, however, this incident is considered a near miss. Bechtel Nevada power linemen were called in to repair the power line and restore power.

Radioactive Contamination on Tool
(NVOO--BNLV-NTS-1997-0012)

On June 5, 1997, at 1710 hours, a Bechtel Nevada employee was exiting the Device Assembly Facility (DAF) compound in Area 6 when the radiological detectors at the personnel gate alarmed. The employee was carrying a hand tool (vice grip) in his back pack that activated the alarm. Security confiscated and held the vice grip until a radiological survey could be done.

The vice grip was surveyed by alpha/beta/gamma detectors. Swipes were taken at the face, handles, and handle adjustment screw. The reading detected was on the adjustment screw threads and on the vice threads. The results are as follows: gamma 0.14 mr/hr contact, background at 30 cm away from the vice grip; alpha: 68 dpm removable (1,500 dpm fixed plus removable); beta: 2,162 dpm (124,000 dpm fixed plus removable); source element: Cesium 137.

According to the DOE Radiological Control Manual DOE/EH-0256T, Table 2-2 the surface contamination level of Cesium 137 is 1,000 dpm and the maximum allowable level (two times Table 2-2) defined in DOE Order 232.1-1 is 2,000 dpm.

A radiological survey also included the Bechtel Nevada employee, two Wackenhut Services, Inc. employees, the work area where the tool was used, back pack, tool box, locker, rooms the employee visited, and the vehicle that the tool was brought in to compound on (suspected). The highest level recorded was 45 dpm beta within the tool box.

The type of radiological contamination involved Cesium 137 is not present within the DAF or compound. Therefore, the vice grip was contaminated somewhere other than the DAF. According to Radiological Safety personnel the vice grip could have been transported into the DAF compound in a tool box on a truck without being detected by the radiological monitors.

The vice grip was confiscated and a radiological survey performed. No spread of or personnel contamination was detected.

Excess Cyanide Detection
(NVOO--BNLV-RSLO-1997-0001)

On April 25, 1997, at 1009 hours, a Bechtel Nevada scientist and Environmental Lead received a lab report that reflected excess levels of cyanide at sewerage manhole outfall #002 at the Remote Sensing Laboratory at Nellis Air Force Base, Nevada. DOE/NV and Clark County officials were immediately notified as required by the

wastewater discharge permit, CCSD-032.

Bechtel Nevada is also required to accomplish a repeat sampling and analysis and submit a written report of follow up sampling to the county within 30 days of becoming aware of the violation. Within five days of discovering the violation, they must submit a written report to the county listing the reasons for the violation and actions to be taken to prevent recurrence.

Waste Management personnel are coordinating with Remote Sensing Laboratory personnel to find the reason for the excess reading for cyanide.

Contamination of Source Locker
(NVOO--BNLV-RSLO-1997-0002)

During a routine quarterly environmental survey, conducted on May 9, 1997, and counted on May 13, 1997, swipes taken around a source locker at the Remote Sensing Laboratory, yielded 245 dpm alpha from inside the vault. On May 14, 1997, a Health Physicist went back to the location where the active swipe was taken to conduct further surveys. Further contamination was found in an office: 1,100 and 1,250 dpm alpha on a chair and 228 dpm alpha on an employee's shirt. A sweep of the employee's private vehicle was negative. This employee will be submitting a bioassay when the contaminant is identified. Although the specific source of contamination is still under investigation, the room has been closed off to Remote Sensing Laboratory employees, and any potential spread of contamination has been curtailed.

To date, seven personnel have been found to have clothing and personal contamination. All have been decontaminated to acceptable levels.

Diesel Generator Fuel Leak
(NVOO--SDNL-TTRO-1997-0002)

A possible spill was reported by a Radar Operator at the Antelope Peak Generator Station at 1330 hours on April 3, 1997. It was discovered that a large drip pan that is beneath both the primary, secondary containment for the external fuel tank and the generator contained approximately seven gallons of a diesel fuel and water mixture. The drip pan has a capacity of more than 150 gallons. The fuel in the drip pan was discovered to have come from a seam of the fuel tank. The soil beneath the drip pan was noticed to be stained. Excavation of that soil began immediately. The area near the Generator Station is mostly fractured rock and fill soil. The excavation continued for four days until continuing it was impractical due to the quantity and size of the fractured rock being removed. Diesel fuel remains in the fissures of the rocks. The excavated hole is approximately five feet in diameter and five feet deep. Approximately 1.5 cubic

yards of soil and a larger quantity of large rock was removed from the site. It is believed that the spill was from a previous generator fuel tank system at the same site.

Demonstration/Protest
(NVOO--WSIN-NTS2-1997-0006)

On Wednesday, April 2, 1997, at approximately 1005 hours, a demonstration was held by 13 personnel at the entrance to the Nevada Test Site in Area 22. Members of the group did not claim affiliation with any particular anti-nuclear group.

The demonstration was peaceful however, seven personnel were arrested for trespassing, cited, and released. No injuries were reported. All demonstrators departed the area at 1117 hours.

Suspicious Package
(NVOO--WSIN-NTS2-1997-0007)

On Wednesday, April 2, 1997, at approximately 1729 hours, the Nevada Test Site Fire Department notified the Wackenhut Services, Inc. Headquarters Lieutenant at the Nevada Test Site that they were responding to a suspicious package reported to be in the area of Old Mercury Highway and U.S. Highway 95. This location was inaccurate as it was verified to be on Old Mercury Highway and Mercury Highway in Area 22 on the Nevada Test Site. The suspicious package was beneath the stop sign on Old Mercury Highway. The package was described as a brown paper bag, neatly folded at the top, the approximate size of a standard shopping bag. The immediate area was cordoned off and incoming and outgoing traffic was rerouted through the 22-1P barricade (Army Well #1 in Area 22).

The local FBI and the Nellis Air Force Base Explosive Ordnance Disposal (EOD) Team was notified and arrived at the Nevada Test Site at 2023 hours and 2110 hours respectively. EOD personnel confirmed at 2205 hours that the material in the suspicious package was not hazardous (the suspicious package contained six empty beer bottles). The area was cleared at 2217 hours and declared safe by on scene personnel. Nevada Test Site traffic returned to normal then.

Demonstration/Protest
(NVOO--WSIN-NTS2-1997-0008)

On Friday, May 30, 1997, at approximately 0705 hours, a demonstration was held by eight personnel at the entrance to the Nevada Test Site in Area 22. Members of the group were affiliated with the Nevada Desert Experience protest group.

The demonstrators assembled at the cattle guard and blocked the entrance to the Nevada Test Site by stopping a tour bus. The Nye County Sheriff's Office responded in addition to the Wackenhut Services, Inc. personnel. The entrance way was cleared at 0728 hours and normal Nevada Test Site traffic commenced. Three demonstrators were arrested, cited, and released. No injuries were reported. All demonstrators departed the area about 0820 hours.

NATURE OF OCCURRENCE

Nature of Occurrence Codes

1	**Facility Condition**	**6**	**Transportation**
2	**Environmental**	**7**	**Value Basis Reporting**
3	**Personnel Safety**	**8**	**Facility Status**
4	**Personnel Radiation Protection**	**9**	**Nuclear Explosive Safety**
5	**Safeguards and Security**	**10**	**Cross-Category Items**

NATURE OF OCCURRENCE DISTRIBUTION
AUGUST 1, 1990 TO JUNE 30, 1997

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	204	147	99	33	98	15	23	11	2	64
Quarter	4	3	1	2	4	0	0	0	0	1

BNLV NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	9	7	3	4	3	4	1	0	0	1
Quarter	4	2	1	2	1	0	0	0	0	1

DSWA NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	0	0	0	2	0	0	0	0	0	0
Quarter	0	0	0	0	0	0	0	0	0	0

NATURE OF OCCURRENCE

Nature of Occurrence Codes

1	**Facility Condition**	**6**	**Transportation**
2	**Environmental**	**7**	**Value Basis Reporting**
3	**Personnel Safety**	**8**	**Facility Status**
4	**Personnel Radiation Protection**	**9**	**Nuclear Explosive Safety**
5	**Safeguards and Security**	**10**	**Cross-Category Items**

GONV NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	5	1	0	0	1	0	0	0	0	1
Quarter	0	0	0	0	0	0	0	0	0	0

ITNV NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	0	1	0	0	0	0	0	0	0	0
Quarter	0	0	0	0	0	0	0	0	0	0

LANV NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	5	0	1	0	0	0	0	0	0	2
Quarter	0	0	0	0	0	0	0	0	0	0

NATURE OF OCCURRENCE

Nature of Occurrence Codes

1	**Facility Condition**	**6**	**Transportation**
2	**Environmental**	**7**	**Value Basis Reporting**
3	**Personnel Safety**	**8**	**Facility Status**
4	**Personnel Radiation Protection**	**9**	**Nuclear Explosive Safety**
5	**Safeguards and Security**	**10**	**Cross-Category Items**

LLNV NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	2	0	2	3	0	1	1	1	0	2
Quarter	0	0	0	0	0	0	0	0	0	0

SDNL NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	0	3	2	0	0	0	0	0	0	1
Quarter	0	1	0	0	0	0	0	0	0	0

WSIN NATURE OF OCCURRENCE

Nature of Occurrence	1	2	3	4	5	6	7	8	9	10
Total	1	0	16	0	42	0	2	0	2	2
Quarter	0	0	0	0	3	0	0	0	0	0

ROOT CAUSE CODES AND DEFINITIONS

Equipment/Material Problem: An event or condition resulting from the failure, malfunction, or deterioration of equipment or parts, including instruments or material.

1A. **Defective or Failed Part:** A part/instrument that lacks something essential to perform its intended function.

1B. **Defective or Failed Material:** A material defect or failure.

1C. **Defective Weld, Braze, or Soldered Joint:** A specific weld/joint defect or failure.

1D. **Error by Manufacturer in Shipping or Marking:** An error by the manufacturer or supplier in the shipping or marking of equipment.

1E. **Electrical or Instrument Noise:** An unwanted signal or disturbance that interferes with the operation of equipment.

1F. **Contaminant:** Failure or degradation due to radiation damage or foreign material such as dirt, crud, or impurities.

1G. **End of Life Failure:** A failure where the equipment or material is run to failure and has reached its end of design life.

1. Equipment/Material Problems reported prior to 4/1/91.

EQUIPMENT/MATERIAL PROBLEM

Root Cause Code	1A	1B	1C	1D	1E	1F	1G	1
Total	45	22	0	3	0	6	0	1
Quarter	0	0	0	0	0	0	0	0

ROOT CAUSE CODES AND DEFINITIONS

Procedure Problem: An event or condition that can be traced to the lack of a procedure, an error in a procedure, or a procedural deficiency or inadequacy.

2A. **Defective or Inadequate Procedure:** A procedure that either contains an error or lacks something essential to the successful performance of the activity.

2B. **Lack of Procedure:** No written procedure was in place to perform the activity.

2. Procedure Problems reported prior to 4/1/91.

PROCEDURE PROBLEM

Root Cause Code	**2A**	**2B**	**2**
Total	37	43	2
Quarter	0	1	0

ROOT CAUSE CODES AND DEFINITIONS

Personnel Error: An event or condition due to an error, mistake, or oversight.

3A. **Inattention to Detail:** Inadequate attention to the specific details of the task.

3B. **Procedure Not Used or Used Incorrectly:** The failure to use or the inappropriate use of written instructions, procedures, or other documentation.

3C. **Communication Problem:** Inadequate presentation or exchange of information.

3D. **Other Human Error:** Human error other than those described above.

3. Personnel Errors reported prior to 4/1/91.

PERSONNEL ERROR

Root Cause Code	**3A**	**3B**	**3C**	**3D**	**3**
Total	56	46	6	33	10
Quarter	3	2	0	0	0

ROOT CAUSE CODES AND DEFINITIONS

Design Problem: An event or condition that can be traced to a defect in design or other factors related to configuration, engineering, layout, tolerances, calculations, etc.

4A. **Inadequate Work Environment:** Inadequate design of equipment used to communicate information from the facility to a person (e.g., displays, labels, etc.) as well as inadequate work environment, such as inadequate lighting, working space, or other human factor considerations.

4B. **Inadequate or Defective Design:** A design in which something essential was lacking (defective) or when a detail was included but was not adequate for the requirement (inadequate).

4C. **Error in Equipment or Material Selection:** A mistake in the equipment or material selection only, not to include a procurement error (see Personnel Error (d) Other Human Error) or a specification error (see Design Problem - (d) Drawing, Specification, or Data Errors).

4D. **Drawing, Specification, or Data Errors:** An error in the calculation, information, or specification of a design.

4 . Design Problems reported prior to 4/1/91.

DESIGN PROBLEM

Root Cause Code	**4A**	**4B**	**4C**	**4D**	**4**
Total	3	37	9	0	1
Quarter	0	1	0	0	0

ROOT CAUSE CODES AND DEFINITIONS

Training Deficiency: An event or condition that can be traced to a lack of training or insufficient training to enable a person to perform a desired task adequately.

5A. **No Training Provided:** A lack of appropriate training.

5B. **Insufficient Practice or Hands-On Experience:** An inadequate amount of preparation before performing the activity.

5C. **Inadequate Content:** The knowledge and skills required to perform the task or job were not identified.

5D. **Insufficient Refresher Training:** The frequency of refresher training was not sufficient to maintain the required knowledge and skills.

5E. **Inadequate Presentation or Materials:** The training presentation or materials were insufficient to provide adequate instruction.

5. Training Deficiencies reported prior to 4/1/91.

TRAINING DEFICIENCY

Root Cause Code	**5A**	**5B**	**5C**	**5D**	**5E**	**5**
Total	1	3	2	4	1	5
Quarter	0	0	0	0	0	0

ROOT CAUSE CODES AND DEFINITIONS

Management Problem: An event or condition that can be directly traced to managerial actions or methods.

6A. **Inadequate Administrative Control:** A deficiency in the controls in place to administer and direct activities.

6B. **Work Organization/Planning Deficiency:** A deficiency in the planning, scoping, assignment, or scheduling of work.

6C. **Inadequate Supervision:** Inadequate techniques used to direct workers in the accomplishment of tasks.

6D. **Improper Resource Allocation:** Improper personnel or material allocation resulting in the inability to successfully perform assigned tasks.

6E. **Policy Not Adequately Defined, Disseminated, or Enforced:** Inadequate description, distribution, or enforcement of policies and expectations.

6F. **Other Management Problem:** A management problem other than those defined above.

6. Management Problems reported prior to 4/1/91.

MANAGEMENT PROBLEM

Root Cause Code	**6A**	**6B**	**6C**	**6D**	**6E**	**6F**	**6**
Total	50	29	15	3	37	33	2
Quarter	3	0	0	0	0	0	0

ROOT CAUSE CODES AND DEFINITIONS

External Phenomena: An event or condition caused by factors that are not under the control of the reporting organization or the suppliers of the failed equipment or service.

7A. **Weather or Ambient Condition:** Unusual weather or ambient conditions, including hurricanes, tornadoes, flooding, earthquake, and lightning.

7B. **Power Failure or Transient:** Special cases of power loss that are attributable to outside supplied power.

7C. **External Fire or Explosion:** An external fire, explosion, or implosion.

7D. **Theft, Tampering, Sabotage, or Vandalism:** Theft, tampering, sabotage, or vandalism that could not have been prevented by the reporting organization.

EXTERNAL PHENOMENA

Root Cause Code	7A	7B	7C	7D
Total	52	13	1	43
Quarter	4	0	0	0

Radiological/Hazardous Material Problem: An event related to radiological or hazardous material contamination that cannot be attributed to any of the other causes.

8A. **Legacy Contamination:** Radiological or hazardous material contamination attributed to past practices.

8B. **Source Unknown:** Radiological or hazardous material contamination where the source cannot be reasonably determined.

RADIOLOGICAL/HAZARDOUS MATERIAL PROBLEM

Root Cause Code	8A	8B
Total	1	1
Quarter	1	1

Other problems reported prior to 4/1/91 were four.

LESSONS LEARNED

excerpts from the DOE Lessons Learned Information Services

The following section discusses selected final reports that go beyond the minimum requirements of DOE Order 232.1 in providing lessons learned worth distribution to the DOE community.

Worker Cut Into Energized 240 Volt Circuit

Lessons Learned: Before starting decontamination and decommissioning (D&D) activities, the controlling organization must ensure energy sources are deenergized by isolation or lock and tag. Field engineers and knowledgeable craft personnel should do a system walk down of all energized lines to decide the energy source and how to isolate for lock and tag purposes.

Discussion: During the day shift on March 25, 1997, an electrician was tasked with doing a zero energy check of electrical conduits in the 105-N Basin, marked for removal (painted with yellow paint). The painted conduit contained electrical conductors marked for removal several days before March 25, 1997. A hold point in the work package required the electrician to verify zero energy, apply black tape to the painted conduit indicating zero energy, and sign the work package. During the day shift on March 25, 1997, the electrician went into the 105-N Basin, applied the black tape to the conduit and signed the work package indicating all electrical conduits with yellow paint had been verified as having zero energy. On the swing shift of the same day, D&D workers were tasked with cutting and removing the conduit using a Sawzall. Eleven cuts on six runs of electrical conduits were made without incident. On the twelfth cut, sparks and arcing were observed by the D&D workers, indicating the twelfth conduit contained energized conductors. No personnel contacted electrical energy sources, and there were no injuries to any of the workers. The workers immediately left the work area and notified their supervisor.

Analysis: During the accident investigation, it was discovered that the electrician tasked with doing the zero energy, had been involved with a job several months before the incident in which several electrical circuit leads were lifted at the breaker panel. The electrician remembered isolating the circuits to the yellow painted conduits marked for cutting during the previous job. Instead of doing the zero energy check, the electrician relied on memory as to which circuits had been isolated and proceeded to apply the black tape and sign off on the work package hold point.

Before initiating the cutting and removal activity, the controlling organization did not walk down the systems to identify energy isolation/lock and tag points. The controlling

organization relied on the electrician to identify and isolate electrical circuits without providing a mechanism for independent verification. The work package was designed for the combination of zero energy checks, and conduit cutting and removal.

Recommended Actions: Work processes should be designed so there are separate identification and isolation or lock and tag, and an independent verification of applied locks and tags. During the identification phase, the controlling organization should identify sources of the hazards, type and magnitude of hazards, steps for shutting down the energy, isolating points, steps for placement of lock and tag, how to do a safe condition check, and steps for removal of the lock and tag.

Fall Protection Prevents Serious Injury/Fatality

Lessons Learned: Proper use of fall protection is a significant concern across the DOE complex. In the past 18 months, at least two fatalities have resulted from inadequate application of fall protection. Lessons learned from these unfortunate events, however, can be conveyed to workers, safety personnel and supervisors, and serious injuries or death averted.

Discussion: On July 11, 1996, a life was saved at the Fernald site because of the conscientious use of personal protection. A Construction Laborer was moving pick board on the roof of Plant 4. During this activity, the worker was standing facing down-slope on a transite roof panel over a 4-foot on-center purlin (I-beam). The worker was wearing a safety harness attached to a retractable lanyard that had received its daily inspection to ensure functionality. Additionally, all of the workers from that group had been briefed on fall protection measures and the requirements of their use. Near the worker were “bottom sheets,” which are thinner sheets of transite insulation exposed after the overlying layer of corrugated transite has been removed. All workers have been instructed to avoid stepping on these layers. When on the roof, all workers walk on pick boards, on transite supported by I-beams, or on the I-beams themselves; the locations of which are clearly marked with red or white paint. As the worker was standing on the I-beam support transite facing down-slope, his right foot slipped. In an attempt to correct himself, the worker found that his left foot was caught in a corrugation “rib.” The worker then fell forward to his knees on an underlying bottom insulation sheet and broke through the layer of transite. After a short free fall, the clutch mechanism of the retractable lanyard engaged, slowing the worker’s descent gently to a complete stop. The worker was not injured because of the incident.

Recommended Actions: This incident was used as an example of the importance of using all appropriate personal protective equipment.

Forklift Damages Active Steam Lines

LESSONS LEARNED

Lessons Learned: The importance of vehicle safety should be stressed for those operating mobile equipment. Attention should be given to all area obstructions.

Discussion: On February 5, 1997, a forklift driver was assisting in the transfer of poly tanks to the C-403 Neutralization Pit project. After leaving the construction area and proceeding to his next assignment, the transfer forklift contacted two steam lines found approximately 16 feet above ground level running between C-400 and C-402. As a result, the steam lines were pulled from the C-400 Chemical Operations facility and the C-402 Lime House. These lines were active.

The operator immediately notified the field supervisor and C-400 Chemical Operations following the incident. Both proceeded immediately to the area to assess the situation and notify the appropriate response personnel. The Plant Shift Superintendent was notified. LMUS Chemical Operations, Security, both LMUS and LMES Safety, LMUS Industrial Hygiene, and LMES Site Operations personnel were also notified for assistance.

Analysis: Inattention to detail was determined to be the root cause of the accident. Attention was focused on egressing a narrow area and overhead obstructions were not observed.

Recommended Actions: The steam main was shut off to prevent additional release of steam. The lines were determined to have Health Physics and asbestos concerns. Therefore, the area was flagged off to isolate it from traffic. The cleanup was completed and the equipment was released from the area.

The area was determined to contain possible asbestos and radiation contamination, and was cordoned off to limit access until cleanup crews could be assembled. Chemical Operations and Asbestos Abatement personnel provided assistance in the cleanup. The area was cleaned and the equipment was monitored and released.

Immediately following the incident, a safety stand down was issued with work being stopped. A safety meeting was held to stress the importance of vehicle safety.

Electrical Safety Success Story at Y-12

Lessons Learned: When hazards are recognized and work is stopped, potential accidents, which could result in human injury or fatality, likely equipment damage, and/or expensive work interruptions, are avoided.

Discussion: In February 1997, when workers were doing a test of a newly installed emergency generator for Building 9210, they discovered that the building HVAC system was installed with an interlock that prevented the HVAC from starting when transferring from normal power to the generator feed. The building manager then issued a work request to maintenance to identify and remove the interlock.

When work began per the work request, a large wire with cracked and damaged insulation was discovered by the electricians while they were tracing circuits in the back of a wiring trough. They decided to stop work, flag off the area, and notify the building manager and their supervisor. The building manager issued another work request to identify the hazard and repair as necessary. The work planner called Industrial Safety and Electrical Maintenance to a meeting to review all hazards before writing the Job Hazard Analysis (JHA).

All of the circuits in the wiring trough were deenergized and locked out per procedure before doing their inspection. Several wires showed signs of arcing and evidence of overheating. The cause seemed to stem from loose electrical connections. The damaged wiring and electrical connectors were replaced and the original job was completed safely.

Analysis: This incident is considered a success because it was handled properly and safely throughout. Without such treatment there was the potential that a worker could have contacted or moved damaged wires causing a fault. The worker could have been badly burned from an electrical flash, suffered electrical shock, or possibly death. In addition, such a fault could have resulted in extensive facility and equipment damage, and an extended power outage, negatively affecting ongoing experimental research in the building. What was done right? The original electricians recognized the hazard and stopped work immediately. They notified the appropriate management right away. Later, through teamwork of all appropriate professional groups, repairs were completed safely.

Why recognize this incident as a success? First, because doing the right actions (recognizing the hazard and stopping work) prevented like injury and damage. Second, because doing work safely should be encouraged and recognized.

Recommended Actions: Share this lesson with employees as an example of the kind of behavior encouraged.

Less Than Adequate Equipment Labeling

Lessons Learned: When doing maintenance on equipment in older facilities, ensure that equipment has been positively identified. Problems may exist in configuration control and labeling in these older facilities.

Executive Summary: Improperly labeled or not labeled equipment poses a personnel hazard when maintenance is required. The wrong piece of equipment was removed in two separate incidents in a six year period. Both incidents took place in the same facility, but in different cells. In one incident, the equipment was mislabeled and in the other case the equipment was not labeled. These incidents led to isolation problems that placed the workers in potentially life threatening situations.

Discussion: A blower on a vessel off-gas system developed a rough bearing and was to be removed for repair. The blower is one of a pair of identical redundant blowers housed in a shielded cell. Since the building was completed in the 1950s, the blowers have been removed several times for repair. The labels have been lost in these repair efforts and the facility prints are not consistent in identifying the blower positions. The proper blower was isolated electrically, but when maintenance personnel entered the cell, the wrong blower was removed. The wrong blower was removed because a photograph was labeled incorrectly. The labeling was based on what was considered the most reliable facility print, which was in error. The breaker for the blower removed was in the tripped position. This allowed the zero energy check to be conducted and work to proceed without proper isolation. Had this breaker been reset during the blower removal, the results may have been fatal.

Recommended Actions: An effort should be made to audit older facilities for proper equipment identification. This is extremely important in older facilities with configuration control. A positive identification should be made for all equipment before performing maintenance.

Personnel Monitor Results Incorrectly Interpreted

Lessons Learned: The operating modes and special features of new or upgraded radiological monitoring equipment need to be incorporated into training to ensure that radiological control technicians (RCTs) fully understand monitoring results. All affected RCTs should receive the training before the equipment is placed in service as part of a facility's formal monitoring program. Training is also necessary if RCTs are reassigned to facilities with unfamiliar monitoring equipment. Additionally, survey procedures

should include instructions on what action(s) to take if survey data differ significantly between monitoring systems, such as hand-held instruments verses portal monitors.

Discussion: On April 2, 1997, beta contamination measuring 20,000 disintegrations per minute (dpm) was detected on an employee's forearm when he surveyed himself on an Eberline PCM-2 whole-body monitor. An RCT who had not yet received PCM-2 training checked the monitor readout and incorrectly interpreted the results as indicating that the contamination was detected on the employee's right sleeve near his forearm. The readout actually indicated the contamination was on the employee's left arm. The RCT surveyed the employee's right arm with a hand-held instrument and thought he detected a much lower level of contamination than the PCM-2 results. Because the RCT surveyed the wrong arm, the hand-held monitor only detected background radiation levels, which the RCT misinterpreted as confirmation of the forearm contamination. After his right arm was decontaminated, the employee successfully surveyed out of the facility.

On April 10, 1997, the same employee alarmed another PCM-2 monitor. A Health Physics Operations supervisor who had received PCM-2 training responded and determined that the contamination was on the employee's left arm. The employee was then instructed to remove his luminous watch from his left wrist and resurvey. The PCM-2 did not alarm. The watch was surveyed for loose surface contamination. None was detected. The watch was then analyzed and found to contain promethium-147. The employee was not aware that his watch contained a radioactive substance. When the alarm response data was downloaded from the monitor that alarmed on April 2, 1997, health physics personnel determined that the attending RCT had interpreted the monitor results incorrectly. Because the employee had placed the watch in his pocket when his arm was decontaminated, he was then able to clear the monitor without alarming it. The RCT was unfamiliar with the new monitor, which had been installed at the facility for approximately one month. Although training sessions had been held to familiarize facility RCTs with the new monitors, the RCT had not attended the training due to scheduling conflicts.

The PCM-2 is the first instrument installed at the facility exits that detects alpha and beta/gamma contamination simultaneously. The PCM-2 monitor has multiple detectors on the right and left sides and it alternates detector positions half way through each monitoring cycle. The PCM-2 is also equipped to store data on actuated detector(s), employees' identification numbers, the date and time of an alarm actuation, and the quantity of contamination detected.

Recommended Actions: Evaluate existing RCT training and health physics procedures to decide if monitoring instrumentation issues are adequately addressed. If not, revise the training or procedures accordingly.

Improper Packaging of Radioactive Material Shipment

Lessons Learned: Unambiguous interface communication regarding job requirements between the contractor and the subcontractor(s) is crucial to ensure that correct information is related and understood. Essential job elements should be proceduralized.

Discussion: On March 3, 1997, a subcontractor Receiving and Transportation department processed two sample shipments for Lockheed Martin Energy Systems (LMES). The sample container 65A-57 on shipping order number C-82104 was a limited quantity of radioactive material. The paperwork for this sample was confused with the shipping order for the nonhazardous sample in container 65A-58 on shipping order number C-82105. As a result the required notation, "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for Radioactive Material, Excepted Package - Limited Quantity of Material, UCN210," was not documented. The nonhazardous sample documentation was mistakenly marked with this information.

The subcontractor Receiving and Transportation department reviewed all shipping documentation and confirmed sample container numbers with Sample Management personnel. The incident was discussed with K-25 Shift Superintendent and LMES site personnel. All sample shipping activities were suspended, and an investigation was initiated.

Analysis: The direct cause of this incident was determined to be inattention to detail due to an interface of work turnover when two sets of paperwork were switched. Contributing causes were identified as procedure inadequacy; work organization and planning; and policy not adequately defined. Information was available which could have prevented the error during routine oversight and reviews. However, none of the information was adequately defined to ensure the error was caught.

The root cause of the incident was procedure inadequacy. The turnover process was not defined clearly enough to prevent the problem, and the reviews were not adequately defined to ensure that an error of this type would be discovered.

Recommended Actions: A crew briefing and required reading explained and confirmed an independent review requirement. The independent review process was proceduralized and contains enough detail to ensure that this type of problem will be discovered if it should occur in the future. A turnover checklist was created which provides a single comparative document. Briefings were provided to affected personnel regarding implementation and use of the checklist.